IORMEE MCRAVIS SAMUEL
16/ENG07/013.
PETROLEUM ENGINEERING
ENG 281

1: $P = \frac{E^2}{R}$

$P = E^2R^{-1}$

$\partial P = \frac{\partial P}{\partial E} \cdot \partial E + \frac{\partial P}{\partial R} \cdot \partial R$

$\frac{\partial P}{\partial E}\ 2ER^{-1} = \frac{2E}{R}$, $\frac{\partial P}{\partial R} = -E^2R^{-2} = \frac{-E^2}{R}$

$\partial P = \frac{2E}{R} \cdot \partial E + \left(\frac{-E^2}{R^2}\right) \cdot \partial R$

$\partial P = \frac{2 \times 200}{8} \cdot (-5) + -\frac{(200)^2}{8^2} \cdot 0.2$

$\partial P = -\frac{2000}{8} - \frac{8000}{64} = -250 - 125 = -375$

$\therefore \partial P$ (change in P) $= -375$ Watts.

2 $y = \frac{kwd^4}{t^3}$ $y = kwd^4t^{-3}$

$\partial y = \frac{\partial y}{\partial k} \cdot \partial k + \frac{\partial y}{\partial w} \cdot \partial w + \frac{\partial y}{\partial d} \cdot \partial d + \frac{\partial y}{\partial t} \cdot \partial t$

$\frac{\partial y}{dk} = \frac{wd^4}{t^3}$ $\frac{\partial y}{dw} = \frac{kd^4}{t^3}$, $\frac{dy}{\partial d} = \frac{4d^3kw}{t^3}$

$\frac{\partial y}{\partial t} = -3kwd^4t^{-4} = \frac{-3kwd^4}{t^4}$

$\partial w = \frac{3}{100}$ of $w = \frac{3w}{100}$

$\partial d = 5/2 \cdot 100$ of $d = 5/2 \times 1/100$ $5/200 = 5d/200$

$\partial t = 4/100$ of $t = 4t/100$

$\partial y = 0 + \frac{kd^4}{t^3} \times \frac{3}{100} + \frac{4d^3kw}{t^3} \times \frac{5d}{200} + -\frac{3kwd^4}{t^4} \times \frac{4t}{100}$

$$\partial y = \frac{k d^4 w}{t^3} \times \left(\frac{3}{100}\right) + \frac{d^4 k w}{t^3} \times \left(\frac{20}{200}\right) - \frac{k w d^4}{t^3} \times \left(\frac{12}{100}\right)$$

$$\partial y = \frac{k w d^4}{t^3} \left(\frac{3}{100} + \frac{20}{200} - \frac{12}{100}\right)$$

$$\partial y = \frac{k w d^4}{t^3} \left(\frac{2}{200}\right) = \frac{k w d^4}{t^3} \left(\frac{1}{100}\right)$$

$$\partial y = y \left(\frac{1}{100}\right)$$

Percentage change in $y = \pm 1$ percent of y